HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

PATENT APPLICATION

ATTORNEY DOCKET NO. 10007351-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Ron Maurer	Confirmation No.:	3319
Application No.:	09/676,866	Examiner:	J. Wu
Filing Date:	September 29, 2000	Group Art Unit:	2623

Title: REDUCTION OF CHROMATIC BLEEDING ARTIFACTS IN IMAGES CONTAINING SUBSAMPLED CHROMINANCE VALUES

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on 12-19-2006.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120 ☐ 2nd Month $450 ☐ 3rd Month $1020 ☐ 4th Month $1590

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 500. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

Respectfully submitted,

Ron Maurer

By: /Hugh Gortler #33,890/

Hugh P. Gortler

Attorney/Agent for Applicant(s)

Reg No. : 33,890

Date : 1/25/2007

Telephone : (949) 454-0898

I hereby certify that this document is being transmitted to the Patent and Trademark Office via eletronic filing.

Date of Transmission: 1/25/2007

Patent
Docket No. 10007351-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

APPEAL NO. __________________

In re Application of:
Ron Maurer

Confirmation No. 3319

Serial No. 09/676,866
Filed: September 29, 2000

Group Art Unit: 2623
Examiner I. Sherali

For: REDUCTION OF CHROMATIC BLEEDING ARTIFACTS IN IMAGES CONTAINING SUBSAMPLED CHROMINANCE VALUES

APPEAL BRIEF

Hugh P. Gortler, Esq.

Hewlett-Packard Company
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

(949) 454-0898

INDEX

1. REAL PARTY IN INTEREST

The real party in interest is the assignee, Hewlett-Packard Development Company.

2. RELATED APPEALS AND INTERFERENCES

No appeals or interferences are known to have a bearing on the Board's decision in the pending appeal.

3. STATUS OF CLAIMS

Claims 1-18, 20-34, 36-43, and 45-48 are pending.

Claims 5-13, 15 and 20-27 are allowed.

Claims 3-4, 18, 30, 31, 33, 37-43 and 46-48 are objected to.

Claims 1-2, 14, 16, 17, 28, 29, 32, 34, 36 and 45 are rejected

The rejections of claims 1-2, 14, 16, 17, 28, 29, 32, 34, 36 and 45 are being appealed.

4. STATUS OF AMENDMENTS

A pre-appeal brief request for review was filed on May 9, 2006, requesting review of the final office action dated February 9, 2006. Prosecution was re-opened, and a non-final office was issued on Sept. 20, 2006. A notice of appeal was filed on Dec. 20, 2006. No amendments were filed subsequent to the final office action.

5. <u>SUMMARY OF CLAIMED SUBJECT MATTER</u>

Base claim 1 recites a method of reducing chromatic bleeding artifacts in a digital image. The method comprises reducing chrominance values of at least some pixels in the digital image (Figure 1, blocks 110-112, page 4, lines 6-13). The chrominance value of a pixel is reduced by an amount that is ***scaled according to its chromatic dynamic range***. The chroma value is modified with respect to chromatic dynamic range so as not to reduce chromaticity too much in regions with essentially uniform bright colors (page 4, lines 11-13).

An example of reducing the original chrominance value (C) is provided on page 5, lines 4-9: $C' = C - f(Y,D) \cdot (C - C_0)$. Parametric expression $f(Y,D)$ scales the amount of relative chroma reduction (C-C_0), where D is the chromatic dynamic range of a pixel being processed. The chromatic dynamic range for each pixel of interest may be computed as the difference between minimum and maximum chroma values of the pixels in a local neighborhood (page 4, lines 22-24).

Base claim 16 recites apparatus for reducing chromatic bleeding artifacts in a digital image. The apparatus comprises a processor for selectively reducing chrominance values of pixels in the digital image. The chrominance values of the pixels are reduced by amounts that are scaled according to chromatic dynamic ranges. For an example of reducing the original chrominance value (C) by amounts that are scaled according to chromatic dynamic ranges, see page 5, lines 4-9. Support for the apparatus can be found at page 9, lines 8-14. Additional support is provided by the exemplary software implementation illustrated in Figure 4 (a computer including a processor 216).

Base claim 29 recites an article for a processor. Referring to Figure 4 and page 9, lines 10-14, the article comprises computer memory 212 and a program 214 stored in the memory 212. The program 214, when executed, causes the processor 216 to reduce chromatic bleeding artifacts in a digital image by selectively reducing chrominance values of pixels in the digital image by amounts that are scaled according to chromatic dynamic ranges of the pixels. For an example of reducing the original chrominance value (C) by amounts that are scaled according to chromatic dynamic ranges, see page 5, lines 4-9.

According to page 3, lines 5+, the method, apparatus and article are particularly suited for reducing chromatic bleeding artifacts in color compound document images containing both natural and computer-generated features. Natural features in photo regions tend to have mild luminance or chrominance transitions. Computer-generated features such as text regions tend to have sharp edges and sharp luminance or chrominance transitions. The method, apparatus and article reduce the chromatic bleeding artifacts that occur at the sharp edges. If not reduced, the chromatic bleeding artifacts would degrade image quality.

Base claim 36 recites an article for a processor, the article comprising memory encoded with instructions for instructing the processor to reduce chromatic bleeding artifacts in a digital image by modifying chrominance values of at least some pixels in the digital image. An exemplary software implementation involving a computer is illustrated in Figure 4 and described on page 9, lines 10-14. Memory is referenced by numeral 212, instructions is referenced by numeral 214, and a processor is referenced by numeral 216.

However, the specification does not limit the memory of claim 36 to computer memory. Page 9, lines 8-9 of the specification states that a method

according to the present invention may be implemented in hardware, software or a combination of the two. For example, a method according to the present invention may be implemented in a platform that uses a dedicated processor and memory instead of computer processor and computer memory.

The manner in which the chrominance values are modified is not at issue. The office action held that the manner of modifying the chrominance values as recited in claim 36 is novel and unobvious. The rejection of claim 36 is based on nonstatutory subject matter. For brevity, support for the modification of chrominance values it is not provided here.

6. <u>GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL</u>

a. Claims 1-2, 14, 16, 17, 28, 29, 32, 34, and 45 are rejected under 35 USC §102(e) as being anticipated by Harrington U.S. Patent No. 6,031,581.

b. Base claim 36 is rejected under 35 USC §101 for reciting nonstatutory subject matter.

7. <u>ARGUMENTS</u>

I
REJECTION OF BASE CLAIMS 1, 16 AND 29 UNDER 35 USC §102 AS BEING ANTICIPATED BY HARRINGTON

Harrington does not teach or suggest reducing the chrominance value of a pixel by an amount that is *scaled according to its chromatic dynamic range*. Harrington modifies a chrominance edge so it looks more like a luminance edge (Abstract, lines 6-8; col. 2, lines 28-32; col. 4, lines 20-23; col. 4, lines 62-64; and col. 5, lines 5-10). Scaling is performed with luminance values, not chrominance values (col., 5, lines 5-14)

Harrington also limits the amount that a chrominance edge can be modified. A scaled chrominance value is clipped or limited by the minimum and maximum of a local neighborhood (col. 5. lines 15-22). That is, the scaled chrominance value is increased to the local minimum, or decreased to the local maximum, or not changed at all if between the local minimum and maximum. No scaling is involved during this clipping operation.

Harrington's method might reduce a chrominance value, and it might reduce it to a local maximum, but it does not reduce it by an amount that is *scaled according to its chromatic dynamic range*.

Page 3, section 7 of the office action dated September 20, 2006 alleges that Harrington's clipping operation (i.e., restricting a chrominance value between maximum and minimum values) involves scaling. Harrington does not support this allegation, since it explicitly distinguishes between a scaling operation and a

clipping operation. Harrington discloses a scaling operation (col., 4, lines 39-41) followed by a clipping operation (col. 5. lines 15-22).

Harrington's clipping operation only reduces chrominance values that are greater than c_{MAX}, The clipping operation increases chrominance values that are less than c_{MIN}. A chrominance value greater than c_{MAX} is set equal to c_{MAX}, and a chrominance value less than c_{MIN} is set equal to c_{MIN}.

Thus, Harrington reduces the original chrominance by an amount that is a function of c_{MAX}, which is an upper limit. Harrington does not reduce the original chrominance by an amount that is a function of the dynamic range D (where D is the difference between c_{MAX} and c_{MIN}).

Moreover, Harrington does not scale the amount of reduction for chrominance values greater than c_{MAX}. The amount of reduction is equal to the difference between the original chrominance value and c_{MAX}.

Therefore, Harrington does not disclose each and every element as set forth in claim 1, either expressly or inherently. Accordingly, the '102 rejection of base claim 1 and its dependent claims 2, 14 and 45 should be withdrawn.

Further, Harrington does not suggest reducing a chrominance value by an amount that is *scaled according to its chromatic dynamic range*. Harrington discloses that chromatic artifacts can result from a discrepancy in slope between a luminance edge and a chrominance edge (coil. 3, lines 36-44). He attempts to reduce these artifacts by modifying the chrominance values to have a change profile more like the luminance (col. 4, lines 21-23). Hence his scaling is performed with luminance values.

The record provides no other evidence of a suggestion to reduce the chrominance value of a pixel by an amount that is *scaled according to its chromatic dynamic range.* Therefore, claims 1-2, 14 and 45 should be allowed over Harrington.

Base claims 16 and 29 also recite that the chrominance values of pixels are selectively reduced by amounts that are scaled according to chromatic dynamic ranges. For the reasons above, base claims 16 and 29 and their dependent claims 17, 28, 32 and 34 should be allowed over Harrington.

II
REJECTION OF BASE CLAIM 36 UNDER 35 USC §101, SECOND PARAGARPH, AS RECITING NON-STATUTORY SUBJECT MATTER

Claim 36 is rejected under 35 USC §101 for reciting nonstatutory subject matter. Claim 36 recites an article comprising memory. However, it is not just any memory. It is memory encoded with instructions for instructing a processor to reduce chromatic bleeding artifacts.

The office action alleges that an article comprising "memory encoded with instructions" is nonstatutory subject matter., but an article comprising a "computer readable medium" is statutory subject matter. However, no legal support or evidence is provided to hold that computer memory constitutes patentable subject matter whereas other types of memory do not.

Perhaps the examiner relies on the Guidelines for Examination of a Patent for Patent Subject Eligibility. Annex IV of the Guidelines states

> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized.
>
> When nonfunctional descriptive material is recorded on some computer-readable medium, in a computer or on an electromagnetic carrier signal, it is not statutory since no requisite functionality is present to satisfy the practical application requirement.
>
> When nonfunctional descriptive material is recorded on some computer-readable medium, in a computer or on an electromagnetic carrier signal, it is not statutory and should be rejected under 35 U.S.C. Sec. 101.

Annex IV does not preclude other forms of memory that can store functional descriptive material. Annex IV does not say that the memory must be computer-readable memory, or that the material encoded in the memory must be a computer program. The crux of Annex IV is functional descriptive material versus nonfunctional descriptive material. The crux is not computer versus non-computer.

Nothing in Annex IV of the Guidelines precludes memory other than computer-readable memory from being statutory subject matter. The memory of claim 36 is encoded with functional descriptive material (instructions) that causes a processor to perform a specific function (reduce chromatic bleeding artifacts in a digital image). To the contrary, Annex IV indicates that claim 36 recites statutory subject matter.

Moreover, the specification supports subject matter that is broader than computer memory. In Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc), this court recognized that "claims 'must be read in view of the specification, of which they are a part.'" Figure 4 shows an exemplary software implementation involving a computer. However, the specification does not limit the memory of claim 36 to computer memory. Page 9, lines 8-9 of the specification states that a method according to the present invention may be implemented in hardware, software or a combination of the two.

The office action indicates that claim 36 is novel and unobvious. Since claim 36 recites statutory subject matter, it should be allowed.

For the reasons above, the rejections of claims 1-2, 14, 16, 17, 28, 29, 32, 34, 36 and 45 should be withdrawn. The Honorable Board of Patent Appeals and Interferences is respectfully requested to reverse these rejections.

Respectfully submitted,

/Hugh Gortler #33,890/
Hugh P. Gortler, Esq.
Registration No. 33, 890

Hewlett-Packard Company
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

(949) 454-0898

Date: January 25, 2007

8. CLAIMS APPENDIX

1. (Previously presented) A method of reducing chromatic bleeding artifacts in a digital image, the method comprising reducing chrominance values of at least some pixels in the digital image, the chrominance value of a pixel reduced by an amount that is scaled according to its chromatic dynamic range.

2. (Original) The method of claim 1, wherein the chromatic dynamic range for each pixel is a function of minimum and maximum chroma values of a local pixel neighborhood, whereby the chromatic dynamic range is determined on a pixel-by-pixel basis.

3. (Original) The method of claim 1, wherein the chrominance values of a pixel are scaled by the ratio C'/C if the original chroma value (C) of the pixel is modified, where C' is the new chroma value.

4. (Previously presented) The method of claim 1, wherein the amount is $C-C_0$, where C is the original chroma value of the pixel, and C_0 is a chromatic modulus derived from a local neighborhood.

5. (Previously presented) A method of reducing chromatic bleeding artifacts in a digital image, the method comprising modifying chrominance values of at least some pixels in the digital image, the pixels being modified according to their luminance values and chromatic dynamic ranges by $C' = C - f(Y,D)\cdot(C-C_0)$, where C' is the new chroma value of the pixel, C is the original chroma value of the pixel, Y is the luminance of the pixel, D is the chromatic dynamic range, C_0 is a chromatic modulus having a value between zero

and C_m, C_m is the minimum chroma of the local neighborhood for the pixel, and $f(Y,D)$ is a parametric expression that determines the amount of relative chroma reduction.

6. (Original) The method of claim 5, wherein $f(Y,D)$ complies with $f(Y,D) \rightarrow 1$ for $Y \rightarrow 1$; and $f(Y,D) \rightarrow 0$ for $D \rightarrow 0$.

7. (Original) The method of claim 6, wherein $f(Y,D)$ also complies with $f(Y,D) \rightarrow 0$ for $D \rightarrow 0$ and $Y \rightarrow 1$.

8. (Original) The method of claim 5, wherein $C_0 = \max[C_m - D, 0]$).

9. (Original) The method of claim 5, wherein the modulus $C_0 = C_m$.

10. (Original) The method of claim 5, wherein $C_0 = 0$.

11. (Original) The method of claim 5, wherein $f(Y,D) = \max\left[1 - \alpha(\frac{1-Y}{D}), 0\right]$, where α is a positive term.

12. (Original) The method of claim 11, wherein $C' = C$ if $Y < (1 - D/\alpha)$.

13. (Previously presented) A method of reducing chromatic bleeding artifacts in a digital image, the method comprising modifying chrominance values of at least some pixels in the digital image, the pixels being modified according to their chromatic dynamic ranges and luminance values, wherein each pixel of interest is mapped by:

determining a chromatic dynamic range;

leaving the pixel unmodified if the chromatic dynamic range is less than a predetermined threshold; and

computing a parametric function if the chromatic dynamic range is greater than the threshold and using the parametric function to modify the chrominance value of the pixel, the parametric function being a function of the luminance and local chromatic dynamic range of the pixel.

14. (Original) The method of claim 1, wherein the digital image is reconstructed from subsampled chrominance values; and wherein the chromatic dynamic range is determined from subsampled chrominance values.

15. (Previously presented) A method of reconstructing a digital image from a luminance channel and subsampled chrominance channels, the method comprising:

interpolating the chrominance channels; and

reducing chromatic bleeding artifacts from the interpolated chrominance channels by selectively reducing chrominance values of at least some pixels in the digital image, the pixels being selectively reduced by amounts that are scaled according to chromatic dynamic ranges; wherein no chrominance values in the digital image are increased according to chromatic dynamic ranges.

16. (Previously presented) Apparatus for reducing chromatic bleeding artifacts in a digital image, the apparatus comprising a processor for selectively reducing chrominance values of pixels in the digital image, the chrominance values of the pixels reduced by amounts that are scaled according to chromatic dynamic ranges.

17. (Original) The apparatus of claim 16, wherein the chromatic dynamic range for each pixel is a function of minimum and maximum chroma values of a local pixel neighborhood; and wherein the processor determines local chromatic dynamic ranges on a pixel-by-pixel basis.

18. (Original) The apparatus of claim 17, wherein the processor scales the chrominance values of a pixel by the ratio C'/C if the original chroma value (C) of the pixel is modified, where C' is the new chroma value.

19. (Cancelled)

20. (Previously presented) Apparatus for reducing chromatic bleeding artifacts in a digital image, the apparatus comprising a processor for modifying chrominance values of at least some pixels in the digital image, the pixels being modified by $C' = C - f(Y,D) \cdot (C - C_0)$, where C' is the new chroma value of the pixel, C is the unmodified chroma value of the pixel, Y is the luminance of the pixel, D is the local chromatic dynamic range, C_0 is a chromatic modulus having a value between zero and C_m, C_m is the minimum chroma of the local neighborhood for the pixel, and $f(Y,D)$ is a parametric expression that determines the amount of relative chroma reduction and that ranges between 0 and 1.

21. (Original) The apparatus of claim 20, wherein $f(Y,D)$ complies with $f(Y,D) \to 1$ for $Y \to 1$; and $f(Y,D) \to 0$ for $D \to 0$.

22. (Original) The apparatus of claim 21, wherein $f(Y,D)$ also complies with $f(Y,D) \to 0$ for $D \to 0$ and $Y \to 1$.

23. (Original) The apparatus of claim 20, wherein C_0 = max[C_m-D,0]).

24. (Original) The apparatus of claim 20, wherein the modulus C_0=C_m.

25. (Original) The apparatus of claim 20, wherein C_0=0.

26. (Original) The apparatus of claim 20, wherein

$f(Y,D) = \max\left[1-\alpha(\frac{1-Y}{D}),0\right]$, where α is a positive term.

27. (Original) The apparatus of claim 26, wherein C'=C if Y<(1-D/α).

28. (Original) The apparatus of claim 16, wherein the processor reconstructs the digital image from subsampled chrominance values; and wherein the processor determines the chromatic dynamic ranges from the subsampled chrominance values.

29. (Previously presented) An article for a processor, the article comprising:

computer memory; and

a program stored in the memory, the program, when executed, causing the processor to reduce chromatic bleeding artifacts in a digital image by selectively reducing chrominance values of pixels in the digital image by amounts that are scaled according to chromatic dynamic ranges of the pixels.

30. (Previously presented) The method of claim 1, further comprising using a luminance value of a pixel being modified to determine an amount of chromatic reduction.

31. (Previously presented) The method of claim 30, wherein a chroma value of a pixel is modified to no more than a chromatic modulus (C_0) if the pixel has a high luminance, and wherein the chroma value of a pixel is not modified if the pixel has a small dynamic range.

32. (Previously presented) The apparatus of claim 16, further comprising using a luminance value of a pixel being modified to determine an amount of chromatic reduction.

33. (Previously presented) The apparatus of claim 16, wherein a chroma value of a pixel is modified to no more than a chromatic modulus (C_0) if the pixel has a high luminance, and wherein the chroma value of a pixel is not modified if the pixel has a small dynamic range.

34. (Previously presented) The article of claim 29, wherein the program further instructs the processor to use a luminance value of a pixel being modified to modify an amount of chromatic reduction.

35. (Canceled)

36. (Previously presented) An article for a processor, the article comprising memory encoded with instructions for instructing the processor to reduce chromatic bleeding artifacts in a digital image by modifying chrominance values of at least some pixels in the digital image, the pixels being modified by $C' = C - f(Y,D) \cdot (C - C_0)$, where C' is the new chroma value of the pixel, C is the unmodified chroma value of the pixel, Y is the luminance of the pixel, D is the local chromatic dynamic range, C_0 is a chromatic modulus having a value between zero and C_m, C_m is the minimum chroma of the local neighborhood for the pixel, and

$f(Y,D)$ is a parametric expression that determines the amount of relative chroma reduction and that ranges between 0 and 1.

37. (Previously presented) The article of claim 34, wherein $f(Y,D)$ complies with $f(Y,D) \rightarrow 1$ for Y $\rightarrow$ 1; and $f(Y,D) \rightarrow 0$ for D $\rightarrow$ 0.

38. (Previously presented) The article of claim 29, wherein $f(Y,D)$ also complies with $f(Y,D) \rightarrow 0$ for D $\rightarrow$ 0 and Y$\rightarrow$1.

39. (Previously presented) The article of claim 34, wherein C_0 = max[C_m-D,0]).

40. (Previously presented) The article of claim 34, wherein the modulus C_0=C_m.

41. (Previously presented) The article of claim 34, wherein C_0=0.

42. (Previously presented) The article of claim 34, wherein $f(Y,D) = \max\left[1 - \alpha(\frac{1-Y}{D}),0\right]$, where α is a positive term.

43. (Previously presented) The article of claim 40, wherein C'=C if Y<(1-D/α).

44. (Canceled)

45. (Previously presented) The method of claim 1, wherein the amount is also scaled according to luminance of the pixel.

46. (Previously presented) The method of claim 4, wherein C_0 = max[C_m-D,0]).

47. (Previously presented) The method of claim 4, wherein the modulus $C_0 = C_m$.

48. (Previously presented) The method of claim 4, wherein $C_0=0$.

9. EVIDENCE APPENDIX

None

10. RELATED PROCEEDINGS APPENDIX

None